Quick Guide for Evaluating Rain Events in the Shoal Creek Watershed

Shoal Creek Watershed Basics

The Shoal Creek watershed is long and narrow, oriented North-South, and the businesses along lower Shoal Cree are at the far south end. Its northern end is roughly the Pickle Research Center just north of 183. Given the shape of the watershed, rainfall many miles upstream can lead to creek flooding downstream even if local rainfall is minimal.

Types of Flooding

Localized Flooding: Occurs as stormwater runoff makes it way to a creek. If storm drain infrastructure is undersized, non-existent or damaged/clogged, there may be flooding of roadways and buildings.

Creek Flooding: Occurs when a creek exceeds its capacity and flows over its banks. Conditions can be heavily influenced by rainfall and runoff upstream in the watershed and by the accumulation of debris at bridges and culverts.

How to Evaluate a Rain Event

1. **Storm Direction**

   Highest Concern: South-to-North Movement
   Storms moving northward along the watershed can produce significant runoff throughout the basin that eventually drains back downstream.

   Moderate Concern: North-to-South Movement
   These storms remain over the watershed longer and can generate substantial runoff.

   Lowest Concern: East-to-West Movement
   Because the watershed is relatively narrow east-to-west, these storms typically move through more quickly and affect less of the watershed at one time.

2. **Storm Speed**

   Fast-Moving Storms
   Generally, less concerning because rainfall does not remain over the watershed for long.

   Slow-Moving Storms
   More concerning because rainfall can accumulate over a longer period.

Stalled or Training Storms
Highest concern. "Training" occurs when multiple rounds of storms repeatedly move over the same area. Stalled or training storms can quickly produce dangerous flood conditions.

3. **Rainfall Intensity and Duration**
   Heavy rainfall over a short period can cause street flooding, parking lot flooding and storm drain backups even when creek levels remain relatively low.

   A light rain can still produce flooding if it continues long enough. Extended periods of rainfall can eventually overwhelm drainage systems and increase creek levels.

Additional Factors that Increase Flood Risk

1. **Soil Saturation / Recent Rainfall**
   If the area has experienced recent rainfall the ground will have less capacity to absorb water and more rain will become surface runoff causing creek levels to rise faster.

   Dry conditions allow some rainfall to soak into the ground, reducing immediate runoff until the soils become saturated.

   Example: Memorial Day Flood of 2015
   May 2015 was the wettest May on record in Austin. The saturated soils from previous events contributed significantly to the severity of flooding during the 2015 Memorial Day event.

2. **Storm Drain Condition**

   If storm drain inlets are not working efficiently and water can’t get into the storm drain system, there is likely to be more severe flooding of streets and in areas that drain to the creek. Inlets can be clogged in a number of ways, ranging from erosion controls if there is nearby construction to accumulation of leaves in the fall (or spring for Live Oaks). If you notice a clogged storm drain, please report it via 311 (call or use the 311 web site or app - https://www.austintexas.gov/3-1-1).

Monitoring Conditions on Shoal Creek

Most Important Metric: Gage Height (Water level)
Do not rely primarily on discharge (CFS), as water level is generally the more useful indicator for potential flooding impacts.

Key Monitoring Locations

Shoal Creek at W. 12th Street
Primary location for evaluating flood conditions near downtown businesses.
https://waterdata.usgs.gov/monitoring-location/USGS-08156800/

Shoal Creek at Silverway Drive
Provides an upstream view of conditions moving toward downtown.
https://waterdata.usgs.gov/monitoring-location/USGS-08156675/

Recommended Alert Levels for Conditions at W. 12th Street

The United States Geological Survey (USGS), which operates the two gauges on Shoal Creek, provides a resource for the public to setup warning levels based on conditions at USGS-operated stream gauges (https://accounts.waterdata.usgs.gov/wateralert/). The following are recommended alert levels for the gage at W. 12th Street.

5 Feet: Early Action Level

- Begin monitoring conditions closely.
- Review preparedness plans.
- Move vulnerable inventory if necessary.

7 Feet: National Weather Service Flood Stage

- Elevated awareness is recommended.
- Monitor upstream rainfall closely.

10 Feet: Critical Level

- Creek is generally at or near bank-full conditions.
- Margin for error is significantly reduced.
- Major protective actions should already be underway.

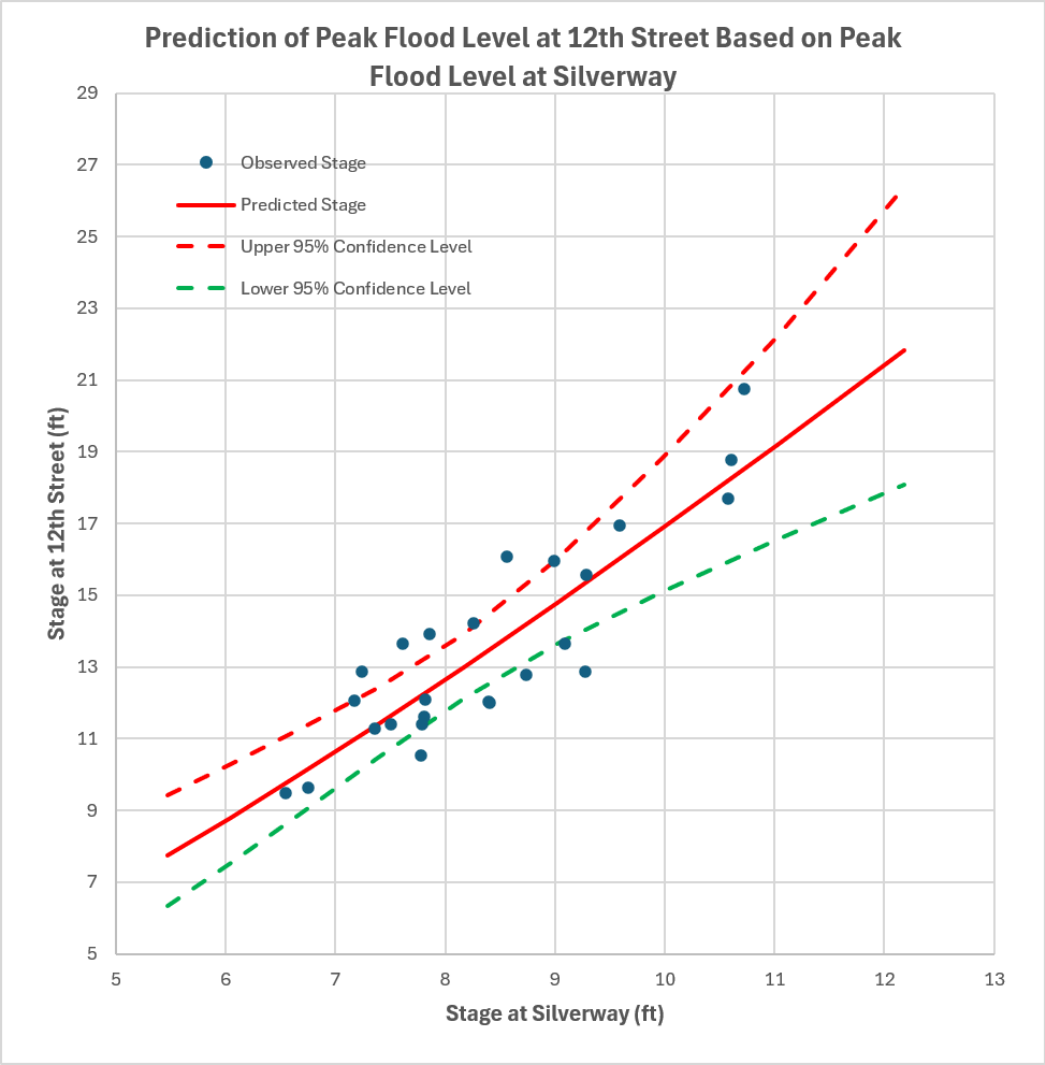
Using the Silverway Station for Early Warning

The Silverway station can provide valuable upstream intelligence.

When monitoring an active storm:

1. Be aware of any National Weather Service flood-related warnings for the area.
2. Watch for rapid increases in water levels at the upstream Silverway station.
3. Note how quickly levels rise.
4. Anticipate additional increases at the 12th Street station.

As a general rule, creek levels often rise several additional feet between Silverway and 12th Street as additional runoff enters the creek. For those that like statistics, the following graph provides an estimate of how high the peak flood level at 12th Street may be based on the peak flood level at Silverway.



The Austin Watershed Protection Department has analyzed over 30 significant events since 2008 on Shoal Creek to provide some guidance on generally how long after the flood level peaks at Silverway until it peaks at W. 12th Street and what the difference in peak level may be. Based on this evaluation, the difference in the time to peak at the gauges generally ranges between 60 and 75 minutes. In other words, it will generally be around an hour for the peak from the upper watershed to reach the Lower Shoal Creek area.

Recommended Monitoring Resources

Emergency Alerts

Warn Central Texas
https://warncentraltexas.org/

Weather Forecasts and Warning Levels

National Weather Service Austin/San Antonio
https://www.weather.gov/ewx/
NWS Flood Safety Products - https://www.weather.gov/safety/flood-products

- **Flash Flood Warning: Take Action!** A Flash Flood Warning is issued when a flash flood is imminent or occurring. If you are in a flood prone area move immediately to high ground. Flash Flood Warnings are now impact-based with three notification tiers - Base, Considerable, & Catastrophic.
- ***Flood Advisory: Be Aware:*** A Flood Advisory is issued when a specific weather event that is forecast to occur may become a nuisance. A Flood Advisory is issued when flooding is not expected to be bad enough to issue a warning. However, it may cause significant inconvenience, and if caution is not exercised, it could lead to situations that may threaten life and/or property.
- ***Flood Watch: Be Prepared:*** A Flood Watch is issued when conditions are favorable for a specific hazardous weather event to occur. A Flood Watch is issued when conditions are favorable for flooding. It does not mean flooding will occur, but it is possible.

Water Level Monitoring

USGS National Water Dashboard – Includes information for the Shoal Creek gauges at W 12th Street and at Silverway.
https://waterdata.usgs.gov/ [Expanded Q...Events_KB | Word]

LCRA Hydromet – Presents rainfall and stream gage information for gauges operated by the USGS, LCRA, and City of Austin.

https://hydromet.lcra.org/ [Expanded Q...Events_KB | Word]

Radar and Rainfall Apps

WeatherFront

- Multiple rainfall forecast models
- Advanced weather analysis
- Must pay premium upfront or monthly

Radar Rainfall

- Rainfall totals
- Short-term AI nowcasting
- Free with advertisements

KXAN Weather App

- Radar imagery
- Future radar projections
- Free to use

Historical Flood Events and “Design” Events

Historical events provide useful context but should not be used as exact predictors. Every storm is different due to:

- Soil moisture conditions
- Storm direction and speed
- Watershed conditions
- Infrastructure changes
- Creek maintenance conditions

Height	CFS	Date	Notes
11.00		March 2006	Water on back patio of Shoal Creek Saloon
14.22	4,280	May 5, 2015	Water started accumulating in the intersection of 10th and Lamar
15.00	4,770	March 20, 2006	Water flowing on Lamar but not in store
15.00		May 2025	Water at top of Whole Earth driveway apron
15.77	4,880	June 9, 2004	
16.50	6,060	Nov 17, 2004	Lamar closed at 9th, water in Cheapos and Wildflower
16.95	6,250	Sept 8,2010	Water flowing down Lamar and at lip of patio in front of Whole Earth
18.78	8,150	Sept 18, 2014	Water flooded the front half of Whole Earth - closed for 5 days to clean up
19.22	8,710	Nov15, 2001	Water 6" deep in Whole Earth, cars on street washed away
20.76	11,000	May 26, 2015	Water 3'+ deep in Whole Earth
23.25	16,000	May 24, 1981	Worst flood on record – Extensive flooding along lower Shoal Creek

The City of Austin uses the rainfall totals listed in the following table in the design of storm drainage systems. These rainfall amounts can give you a feel for what level of flooding may occur for a given rainfall amount. Refer to the City's www.ATXFloodPro.com website to see the flooding extents for certain design storm events.

Design Storm	Rainfall Totals (inches)	
Duration of Design Storm	3-Hour Storm	24-Hour Storm
20% Annual Chance (5-Year)	3.46	5.38
10% Annual Chance (10-year)	4.23	6.65
4% Annual Chance (25-year)	5.40	8.59
1% Annual Chance (100-year)	7.56	12.23
0.2% Annual Chance (500-year)	10.86	18.05